

Activity 31

OBJECTIVE

To obtain truth values of compound statements of the type $p \wedge q$ by using switch connections in series.

MATERIAL REQUIRED

Switches, electric wires, battery and lamp/bulb.

METHOD OF CONSTRUCTION

1. Connect switches S_1 and S_2 in series (See Fig. 31)
2. Connect battery and lamp so as to complete the circuit as shown in the figure.

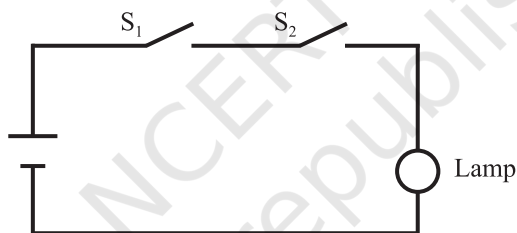


Fig. 31

DEMONSTRATION

1. The lamp will glow if both the switches S_1 and S_2 together are on. This gives the following results :

Switch S_1	Switch S_2	Status of lamp
on	off	not glow
on	on	glow
off	on	not glow
off	off	not glow

Let p and q represent the statements as follows :

p : S_1 is on, truth value of p is T.

$\sim p$: S_1 is off, truth value of p is F.

q : S_2 is on, truth value of q is T.

$\sim q$: S_2 is off, truth value of q is F.

When the lamp glows, truth value of $p \wedge q$ is T. When the lamp does not glow, truth value of $p \wedge q$ is F. Thus, from the circuit, the following table gives the truth values of $p \wedge q$.

p	q	$p \wedge q$
T	T	T
F	T	F
T	F	F
F	F	F

OBSERVATION

1. If S_1 is on, truth value of p is _____.
If S_1 is off, truth value of p is _____.
If S_2 is on, truth value of q is _____.
If S_2 is off, truth value of q is _____.
2. If S_1 is on, S_2 is off, truth value of $p \wedge q$ is _____.
If S_1 is on, S_2 is on, truth value of $p \wedge q$ is _____.
If S_1 is off, S_2 is off, truth value of $p \wedge q$ is _____.
If S_1 is off, S_2 is on, truth value of $p \wedge q$ is _____.
If S_1 is _____, S_2 is _____, truth value of $p \wedge q$ is T.

APPLICATION

This activity may help the students in understanding truth values of the statements $p \wedge q$ in different cases of the statements p and q .